

What is claimed is:

1           1.     A solid-state imaging element, comprising:  
2                 a plurality of light-receiving sensors converting optical signals to electrical  
3 signals; and  
4                 a memory storing the electrical signals as optical image data, said memory being  
5 formed of a plurality of line buffers.

1           2.     The solid-state imaging element of claim 1, further comprising:  
2                 a first switch circuit connecting one of the line buffers and said light-receiving  
3 sensors.

1           3.     The solid-state imaging element of claim 2, wherein the data in the line  
2 buffers are output in parallel.

1           4.     The solid-state imaging element of claim 1, further comprising:  
2                 a second switch circuit selecting one of the line buffers to output the electrical  
3 signal.

1           5.     A solid-state imaging element, comprising:

1 a plurality of light receiving sensors arranged as m sensors in each of n lines  
2 to convert optical signals to electrical signals; and  
3 a memory storing the electrical signals as optical image data, said memory  
4 being formed of a plurality of buffers, each buffer storing m data.

1 6. The solid-state imaging element of claim 5, further comprising:  
2 a switch circuit connecting one of the buffers and said light-receiving sensors.

1 7. The solid-state imaging element of claim 6, further comprising:  
2 a transfer control circuit selecting certain ones of said light-receiving sensors  
3 to supply the electrical signal to the buffers.

1 8. An image processor, comprising:  
2 a solid-state imaging element comprising a plurality of light receiving sensors  
3 to convert optical signals to electrical signals;  
4 an encoder encoding the electrical signals in units of  $n \times m$  pixels; and  
5 an electrical signal holder within said solid-state imaging element comprising  
6 line buffers.

1 9. The image processor of claim 8, further comprising:  
2 a first switch circuit connecting one of the line buffers and the light receiving sensors.

1           10.    The image processor of claim 9, wherein data in the line buffers are output in  
2 parallel.

1           11.    The image processor of claim 8, further comprising:  
2                   a second switch circuit selecting one of the line buffers and outputting an  
3 electrical signal thereto.

1           12.    The image processor of claim 8, wherein said encoder is a JPEG encoder.

1           13.    An image processor, comprising:  
2                   a solid-state imaging element having a plurality of light-receiving sensors to  
3 convert optical signals into electrical signals;  
4                   a code encoder encoding the electrical signals in units of  $n \times m$  pixels; and  
5                   an electrical signal holder within said solid-state imaging element comprising  
6 a plurality of buffers, each buffer storing  $m$  data.

1           14.    The image processor of claim 13, further comprising:  
2                   a switch circuit connecting one of the buffers and the light-receiving sensors.

1           15.    The image processor of claim 13, further comprising:

1 a transfer control circuit selecting certain ones of the light-receiving sensors  
2 to supply an electrical signal to the buffers.

1 16. The image processor of claim 13, wherein said code encoder is a JPEG  
2 encoder.

1 17. An image processing method, comprising:  
2 converting optical signals to electrical signals in a plurality of light-receiving  
3 sensors;  
4 outputting the electrical signals in units of  $n \times m$  blocks of pixels; and  
5 encoding the electrical signals.

1 18. A charge-coupled device (CCD), comprising:  
2 a vertical CCD having a plurality of photosensors arranged in  $v$  vertical lines  
3 and  $n$  horizontal lines corresponding to an  $n \times v$  frame of pixels, and converting optical  
4 signals to electrical signal image data;  
5 a horizontal CCD having  $n$  line buffers, each buffer holding up to  $v$  pixels of  
6 image data;  
7 a first switch circuit connected to each of the vertical lines and the line  
8 buffers;

1 a first switch control circuit controlling said first switch circuit so that each  
2 line buffer sequentially connects to said vertical CCD, the image data in sequential ones of  
3 the n horizontal lines of said vertical CCD being transferred to a corresponding one of the n  
4 line buffers;

5 a second switch circuit connected to the line buffers and an external circuit;  
6 and

7 a second switch control circuit controlling said second switch circuit so that  
8 each line buffer sequentially connects to the external circuit, the image data in the line  
9 buffers being transferred to the external circuit in blocks of  $n \times m$  ( $m < v$ ) pixels, each line  
10 buffer in each block transferring m pixels.

1 19. A charge-coupled device (CCD), comprising:

2 a vertical CCD having a plurality of photosensors arranged in v vertical lines  
3 and n horizontal lines corresponding to an  $n \times v$  frame of pixels, each horizontal line being  
4 divided into k line sections, each line section corresponding to m ( $m < k$ ) pixels of image  
5 data, and converting optical signals to electrical signal image data;

6 a horizontal CCD having k line buffers connected to an external circuit, each  
7 line buffer holding up to m pixels of image data;

8 a switch circuit connected to the line buffers and the external circuit;

9 a transfer control circuit controlling said vertical CCD such that blocks of  $n \times$   
10 m pixels of image data are transferred from said vertical CCD to the line buffers, wherein a

1 first one of the buffers receives  $m$  pixels from a horizontal line and outputs the  $m$  pixels to  
2 the external circuit before receiving another  $m$  pixels from the next horizontal line and so  
3 forth until a first block of  $n \times m$  pixels has been transferred and output, and repeating the  
4 transfer and output operations for each remaining line buffer and the remaining image data;  
5 and

6 a switch control circuit controlling said switch circuit so that each line buffer  
7 sequentially connects to the external circuit to output the image data to the external circuit.

1 20. A charge-coupled device (CCD), comprising:

2 a vertical CCD having a plurality of photosensors arranged in  $v$  vertical lines  
3 and  $n$  horizontal lines corresponding to an  $n \times v$  frame of pixels, and converting optical  
4 signals to electrical signal image data;

5 a horizontal CCD having  $n$  line buffers, each buffer holding up to  $v$  pixels of  
6 image data;

7 a switch circuit connected to each of the vertical lines and the line buffers;

8 and

9 a switch control circuit controlling said switch circuit so that each line buffer  
10 sequentially connects to said vertical CCD, the image data in sequential ones of the  $n$   
11 horizontal lines of said vertical CCD being transferred to a corresponding one of the  $n$  line  
12 buffers, and the image data in the  $n$  line buffers being output in parallel to the external  
13 circuit.

1           21. A charge-coupled device (CCD), comprising:

2                   an array of photosensors arranged in  $v$  vertical lines and  $n$  horizontal lines  
3 corresponding to an  $n \times v$  pixel array of image data; and

4                   a plurality of  $n$  line buffers, each line buffer holding up to  $v$  pixels of image  
5 data,

6                   wherein each line buffer sequentially connecting to said array, the image data  
7 in sequential ones of the  $n$  horizontal lines of said array being transferred to a corresponding  
8 one of the  $n$  line buffers, and each line buffer sequentially outputting the image data, the  
9 image data in the line buffers being output in blocks of  $n \times m$  ( $m < v$ ) pixels, each line  
10 buffer in each block outputting  $m$  pixels.

1           22. A charge-coupled device (CCD), comprising:

2                   an array of photosensors arranged in  $v$  vertical lines and horizontal lines  
3 corresponding to an  $n \times v$  pixel array of image data, each horizontal line being divided into  $k$   
4 line sections, each line section corresponding to  $m$  ( $m < k$ ) pixels of image data; and

5                   a plurality of  $k$  line buffers, each line buffer holding up to  $m$  pixels of image  
6 data,

7                   wherein blocks of  $n \times m$  pixels of image data are transferred from the array of  
8 photosensors to the line buffers, such that a first one of the buffers receives  $m$  pixels from a  
9 horizontal line and outputs the  $m$  pixels before receiving another  $m$  pixels from the next

1 horizontal line and so forth until a first block of  $n \times m$  pixels has been transferred and  
2 output, and repeating the transfer and output operations for each remaining line buffer and  
3 the remaining image data.

1 23. A charge-coupled device (CCD), comprising:

2 an array of photosensors arranged in  $v$  vertical lines and  $n$  horizontal lines  
3 corresponding to an  $n \times v$  pixel array of image data; and

4 a plurality of  $n$  line buffers, each line buffer holding up to  $v$  pixels of image  
5 data,

6 wherein each line buffer sequentially connecting to said array, the image data  
7 in sequential ones of the  $n$  horizontal lines of said array being transferred to a corresponding  
8 one of the  $n$  line buffers, the image data in the  $n$  line buffers being output in parallel.

1 24. A method of outputting image data from a charge-coupled device (CCD),  
2 comprising:

3 arranging a plurality of photosensors in  $v$  vertical lines and  $n$  horizontal lines  
4 corresponding to an  $n \times v$  pixel array of image data;

5 connecting, sequentially, each one of a plurality of  $n$  line buffers to the array  
6 of photo sensors, each line buffer holding up to  $v$  pixels of image data, and transferring the  
7 image data in sequential ones of the  $n$  horizontal lines of the array to a corresponding one of  
8 the  $n$  line buffers; and



1           outputting, sequentially, the image data of each line buffer, the image data in  
2           the line buffers being output in blocks of  $n \times m$  ( $m < v$ ) pixels, each line buffer in each  
3           block outputting  $m$  pixels.

4  
5           25. A method of outputting image data from a charge-coupled device (CCD),  
6           comprising:

7           arranging a plurality of photosensors in  $v$  vertical lines and  $n$  horizontal lines  
8           corresponding to an  $n \times v$  pixel array of image data;

9           dividing each horizontal line into  $k$  line sections, each line section  
10          corresponding to  $m$  ( $m < k$ ) pixels of image data;

11          transferring blocks of  $n \times m$  pixels of image data from the array of  
12          photosensors to a plurality of  $k$  line buffers, each line buffer holding up to  $m$  pixels of image  
13          data, such that a first one of the buffers receives  $m$  pixels from a horizontal line and outputs  
14          the  $m$  pixels before receiving another  $m$  pixels from the next horizontal line and so forth  
15          until a first block of  $n \times m$  pixels has been transferred and output, and repeating the transfer  
16          and output operations for each remaining line buffer and the remaining image data.

1           26. A method of outputting image data from a charge-coupled device (CCD),  
2           comprising:

3           arranging a plurality of photosensors in  $v$  vertical lines and  $n$  horizontal lines  
4           corresponding to an  $n \times v$  pixel array of image data; and

1 connecting, sequentially, each one of a plurality of  $n$  line buffers to the array  
2 of photo sensors, each line buffer holding up to  $v$  pixels of image data, and transferring the  
3 image data in sequential ones of the  $n$  horizontal lines of the array to a corresponding one of  
4 the  $n$  line buffers, and outputting the image data in the  $n$  line buffers in parallel.